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(54) ## MICROWAVE-HEATED COOKED FOODS.

(57) Microwave-heated cooked foods filled in a see-through package in which the contents can be stored for a long time at ordinary temperature, particularly in a package made of a transparent wrapping material having high oxygen and water vapor barrier properties and a high microwave permeability. The wrapping material comprises a heat-reistant synthetic resin film or laminate, a heat-sealable heat-resistant synthetic resin film or laminate as an innermost layer, and an intermediate layer of a single metal oxide, particularly a thin film of silicon oxide or mixture thereof. After filling the package with the contents, it is irradiated with microwave to heat and sterilize, thus giving cooked foods having a long shelf life.

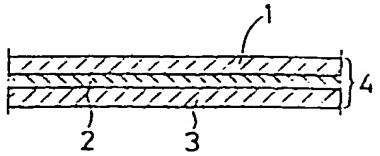

FIG.1

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SPECIFICATION

MICROWAVE HEATED COOKED FOODS

Technical Field

The present invention relates to a microwave heated cooked food the contents of which are visible and which makes prolonged preservation of the contents possible at normal temperatures, and particularly to a microwave heated cooked product in which a transparent and microwave permeable packaging material having high oxygen gas as well as moisture barrier properties is used.

Background Art

At present, foods are sterilized in accordance with retortable sterilizing process in order to distribute sealed food packages for long-term preservation at ordinary temperatures. In this respect, the sterilization is performed by utilizing a heating medium having a temperature of 100°C or more under pressure. In this case, however, an extremely long period of time such as 15 - 60 minutes at 120°C is required for satisfying a prescribed sterilizing condition dependent upon the properties of a food (particularly one containing solid matters) to be packaged, because heat for the sterilization which reaches the center of the food is principally determined by heat conduction of the food. For this reason, a packaging material as well as a food are exposed to a high temperature for a long period of time, and as a result a packaging material of high

quality and high cost is required in this case, besides there is the most significant disadvantage which is the damage in touch in eating, taste, color and the like of the food. On one hand, a packaging material which is transparent and can watch the contents of the package has low oxygen gas barrier properties so that such foods after sterilization could not be preserved for a long period of time with the packaging material as described above. Furthermore, in these retortable sterilizing processes, high-degree skill was required for the pressure regulation for preventing a package from a burst thereof, since the sterilization is conducted under pressure in the processes.

In place of such retortable sterilizing process, another sterilizing process in which the heating can be attained by means of microwave for a short period of time is noticed, and such a sterilizing process wherein the sterilization is conducted by irradiating microwave under pressure as in the case of retortable sterilizing process has been presented from the U.S. Army Research Institute. However, since this process is one in which microwave is irradiated under pressure, the pressure regulation therefor is difficult as in retortable sterilizing process, besides the sterilizer therefor becomes complicated and expensive, so that it was difficult to generally use the process.

As another sterilizing process utilizing microwave, a process in which packages containing foods to be sterilized are placed in a supporting holder made from a microwave permeable material, and microwave is irradiated from the outside of the

supporting holder thereby to sterilize the foods has been proposed as disclosed in Japanese Patent Publication No. 26949/1983. According to this process, while the sterilization can be effected by placing packages in a supporting holder and irradiating the packages with microwave process involves such disadvantages that there arises unevenness in heating, and remarkable scorched foods are observed particularly in the case where foods of a low moisture content are sterilized.

Moreover, although a process and an apparatus for continuously conducting microwave sterilization under normal pressures have been proposed, it was difficult to use a transparent packaging material having high barrier properties, so that a suitable food packaging material for an extended long-term preservation could not be obtained.

Disclosure of the Invention

It is an object of the present invention to provide a microwave heated cooked food the contents of which is visible through the packaging material and which can be preserved for a long period of time at ordinary temperatures.

More specifically, the object of the invention resides in manufacture of a sealed microwave heated cooked food which is obtained by irradiating continuously the sealed food with microwave under normal pressures to efficiently sterilize the food without damaging the quality of the food, besides the contents of the sealed cooked food may be watched and deterioration in quality of the food can be prevented during preservation thereof at ordinary temperatures.

In order to attain the above object, it is the necessary condition that foods are sealed with such a packaging material which permeates efficiently microwave, which accompanies no physical damage during the course of sterilization and cooling steps as well as a step for distributing the packages as the final products at normal temperatures, besides which is transparent and has barrier properties with respect to oxygen and moisture which do not cause changes or the like in the ingredients of a food being the contents of the package.

Conventional problems have been solved by means of the microwave heated cooked food the contents of which can be observed and which is possible to be preserved at normal temperatures for a long period of time in accordance with the present invention. The microwave heated cooked food of the present invention is manufactured by placing a food or the like into any of a packaging pouch, molded container or bowl made from a transparent and microwave permeable laminated packaging material which is prepared by disposing a thin layer of a metallic oxide alone or a mixture thereof, as an intermediate layer, between a heat resistant synthetic resin film base alone or a laminate thereof and a heat-sealable, heat resistant synthetic resin film alone or a laminate obtained therefrom containing said film as the innermost layer; sealing the package containing the food or the like; placing the sealed package into a supporting holder; and heating the package placed in the supporting holder in a microwave irradiating

oven to a temperature of 100°C or more to sterilize the food or the like.

In the above case, the food permeates microwave to a certain extent and is directly heated from the inside thereof so that a temperature at the innermost part of the food can be raised for a short period of time. In this case, when a microwave permeable supporting holder is used, the package can be prevented from a burst thereof due to steam pressure. Furthermore, since a packaging material having a structure of a heat resistant synthetic resin film/a metallic oxide thin layer/ heat-sealable heat resistant synthetic resin film is used in the present invention, the packaging material permeates microwave and the contents of the package can be observed. There is no deterioration of gas barrier properties at the time of or after irradiation of microwave, so that preservation of the food or the like at ordinary temperatures becomes possible for a long period of time.

Brief Description of the Drawings

Fig. 1 is a partial sectional view showing an example of a packaging material used for the microwave heated cooked food according to the present invention;

Fig. 2 is an explanatory view, in section, showing the microwave heated cooked food according to the present invention which illustrates a state wherein the cooked food is placed in a package;

Fig. 3 is an explanatory view, in section, showing the case where a tray is used;

Fig. 4 is an enlarged partial sectional view showing a body of a plastic cylindrical container being an example of the present invention;

Fig. 5 is a general view of Fig. 4 wherein the section of the cylindrical container is enlarged;

Fig. 6 is a sectional view showing a cylindrical container according to the present invention; and

Fig. 7 is a sectional view showing a polypropylene single layer container having a thickness of 300 u used in a conventional method.

In these Figures, reference numeral 1 designates a heat resistant synthetic resin film base alone made of polyester and the like or a laminate thereof, 2 a metallic oxide layer, 3 a heat-sealable heat resistant synthetic resin film, 4 a packaging material composed of these laminates, 5 a food, and 6 and 7 a tray and a cover made from similar packaging material 4, respectively. In Figs. 4 and 5, reference character A designates a cast polypropylene layer, B a urethane adhesive layer, C a silicon oxide metallized layer, D a polyester layer, H a cast polypropylene layer, J a laminated material composed of said layers, K an outer packaging material composed of a 200 u cast polypropylene layer E, a 500 u polypropylene layer F, and a 30 - 50 u polypropylene layer G, respectively, and the outer packaging material K is bonded to the laminated material J with the urethane adhesive B of 4.5 g/m^2.

In Fig. 6, reference character a designates a cylindrical container body, b a cover, and c a food, respectively. Moreover, Fig. 7 shows a conventional retortable pouch wherein reference character d designates a 300 u polypropylene single layer cup-like container, and e a sealing cover material of a 80 u polypropylene single layer, respectively.

The Best Mode for Embodying the Present Invention

First, the packaging materials according to the present invention will be described hereinbelow.

The packaging material according to the present invention is required at the least for heat resisting properties for high-temperature sterilization, physical strength for high-temperature sterilization under normal pressures, transparency by which the contents of the package can be observed, micorwave permeability for microwave sterilization, and gas such as oxygen or the like as well as moisture barrier properties for providing long-term preservation at ordinary temperatures. For the reasons as described above, a laminating material prepared from the following materials and in accordance with the following methods is required.

More specifically, a heat resistant film such as polyester, nylon, polypropylene or the like film alone or a laminate prepared therefrom is used as a heat resistant synthetic resin film base material. Furthermore, a heat resistant polyolefin such as cast polypropylene or the like alone or a laminate prepared from said heat resistant polyolefin, as the innermost layer, and another heat resistant

film such as polyester, nylon, polypropylene or the like film, e. g. a polyester film/ cast polypropylene film laminate, a oriented nylon film/ cast polypropylene film laminate, a oriented polypropylene film/ cast polypropylene film laminate or the like is used as a heat-sealable heat resistant film.

An example of the metallic oxide intermediate layer disposed between the aforesaid base material and said heat-sealable film includes titanium oxide, zinc oxide, aluminum oxide, silicon oxide, magnesium oxide, manganese oxide, and other microwave permeable metallic oxides, and aluminum oxide, silicon oxide and the like are optimum in practical use, besides aluminum oxide/silicon oxide, mixtures thereof and the like are also effective.

The metallic oxide thin layer used in the present invention can be generally formed on the surface of a synthetic film in accordance with vacuum metallizing process or sputtering process, and the layer thickness of 500 - 1000 Å is desirable. Examples of relationship between metallized layer thickness and barrier properties will be shown in Table 1.

Table 1

Metallized Layer Thickness (Å)	Amount of Oxygen (O_2) Permeated (cc/m^2.24 hr.atm. 25°C)	Moisture Permeability (g/m^2. 24 hr.)
500	0.9	2.0
600	0.5	1.5
750	0.5	1.2
1000	0.2	0.8

Table 1 indicates examples of barrier properties in the case where a silicon oxide thin layer having a thickness of 500 - 1000 Å is formed on a polyester film of a thickness of 25 μ in accordance with vacuum metallizing method.

While a laminating process for these films is not particularly limited to a specific method, it is publicly known that adhesive strength of the films are improved by providing a modified polyolefin (for example, polyolefins containing carboxyl group and the like) layer between a heat resistant sealing material layer and a thin metallic oxide layer.

Next, a cooking method by microwave heating according to the present invention will be described hereinbelow.

The present invention relates to a microwave heated cooked food which is possible to be preserved for a long period of time characterized in that said cooked food is manufactured by the steps of preparing a pouch from a heat resistant laminated material having oxygen and moisture barrier properties as well as microwave permeability and containing a thin metallic oxide layer as described above as an intermediate layer, charging the resulting pouch with a food and the like, particularly a cooked food containing solid matter through the opening of the pouch, sealing the opening of the pouch so as to leave a vent at a part of the opening, then placing the pouch charged with food in a supporting holder provided with a containing part which has substantially the same configuration with that of the pouch charged and a capacity wherein said pouch charged can be contained, and which is prepared from a microwave permeable

material such as a synthetic resin, Teflon (a trademark), polycarbonate, polyphenylene sulfide, polyacetal or the like as well as various ceramics and the like, placing continuously such supporting holders each containing the pouch charged in a primary microwave irradiating oven to heat them at a temperature of about 100°C, sealing each vent of these pouches, thereafter placing continuously the supporting holders with the pouches charged in a secondary microwave irradiating oven to heat them up to a prescribed temperature more than 100°C, and cooling immediately the pouch charged together with the supporting holders to take out the packaged pouch containing the cooked food. When compared with a conventional heating sterilization, loss of touch in eating, taste, color, texture or the like of food is less in the heating sterilization method according to the present invention, so that cooked foods which can be preserved at ordinary temperatures could be obtained.

In the above described method, although the primary heating was carried out under such condition that the pouch was charged with cooked food and sealed after leaving a vent on a part of the opening, such pouch may be heated in the primarily heating microwave irradiating oven without any modification after sealing the pouch with leaving no vent on the opening. Furthermore, the heating operation may not only be conducted twice, but also once by means of a microwave irradiating oven. Even if one time heating is conducted by means of microwave irradiation, more effective sterilization can be attained by turning over or vibrating a package prepared from said pouch.

In stead of said package, a molded container having such construction wherein a container main body obtained by deep drawing the aforesaid laminated material is prepared, the container main body is charged with contents to be packaged, and then the container main body is sealed with the same laminated material, or a cylindrical container wherein a body part of the container is prepared by the use of the laminated material, and the top and the bottom thereof are sealed with covering materials, respectively, may also be used, and when these containers are subjected to the same treatment as mentioned above in accordance with the present invention, cooked foods which can be preserved at ordinary temperatures for a long period of time are obtained.

[Test Example 1]

Results of taste and organoleptic examinations after the preservation for 6 months immediately after heating sterilization of various cooked or processed foods in accordance with a conventional retortable method and the method of the present invention, respectively, will be shown hereinafter. The taste and organoleptic examinations were effected by ten panelists with respect to appearance, smell, taste, changes in texture, existence of foul smell and the like of the cooked or processed foods, and the results obtained were indicated by score and specially mentioned matters. The score was represented by such a manner that the best level in various items of food is evaluated as a maximum of 5 points, and

relative comparison is conducted. A standard for the score is as follows.

5.0 ... the best

4.0 ... good

3.0 ... limit for commercial value

2.0
1.0 } no commercial value

0 ... uneatable

Outlines of a prior art or conventional as well as the present invention methods are as described hereinbelow.

Prior Art Method

Various foods were cooked and processed, and then a pouch made of polyester (12 u)/vinylidene chloride (20 u)/ cast polypropylene (70 u) was charged with the cooked and processed foods and the pouch was sealed, and thereafter the sealed pouch was statically retorted (including cooling period of time) in 125^{o}C hot water. Taste and organoleptic evaluations were made upon these products immediately after the retortable sterilization as well as the products which were left naturally in a room (20 - 30^{o}C) for six months, respectively.

Method of the Present Invention

Various foods were cooked and processed, and then a pouch made of polyester (25 u)/silicon oxide (600 Å)/ cast polypropylene (70 u) was charged with the cooked and processed foods and sealed the same while leaving a vent on a part of the pouch, the resulting package of the so charged pouch at normal temperatures was irradiated in a primary microwave oven having an oscillation output of 3 KW for 3 minutes, and heated up to

95°C, thereafter the vent was sealed while maintaining the temperature for 3 minutes. the so sealed pouch was placed in a secondary microwave oven having an oscillation output of 1 KW to irradiate the sealed pouch for 3 minutes and maintained at 125°C for 6 minutes, and then cooled for 3 minutes. Taste and organoleptic evaluations were made upon these products immediately after the heating sterilization as well as the products which were left naturally in a room (20 - 30°C) for six months, respectively, as in the case of the prior art method. Each charged amount of the package was 150 g.

Table 2: Taste and Organoleptic Examinations Immediately After Heating Sterilization and After Preservation for 6 Months in Prior Art and the Present Invention Methods

Food	Principal Raw Material	Heating Sterilization Time	Organoleptic Examination: Taste and Organoleptic Tests Immediately After Heating Sterilization				Taste and Organoleptic Tests After Preservation for 6 Months			
			Prior Art		Present Invention		Prior Art		Present Invention	
			Evaluation	Color The Others	Evaluation	Color The Others	Evaluation	Color The Others	Evaluation	Color The Others
A. 1. Boiled Short necked Clam in Water	Short-necked Clam, Salt	Prior Art: 40 min. Present Invention: 20 min.	4.0	Slightly Browned, Slight Decrease in Flavor	5.0	good	2.0	Browned, Inferior in Both Flavor & Taste No Commercial Value.	4.0	Slightly Browned, Slight Decrease in Flavor
2. Boiled Bamboo Shoot	Bamboo Shoot	Prior Art: 55 min. Present Invention: 25 min.	4.5	Good, Slightly Bad Feeling in Eating	5.0	do.	3.5	Slightly Browned, Change in Flavor, Bad Feeling in Eating.	4.3	do., Slight Shortage for Touch in Eating
3. Mushroom	Mushroom, Salt, L-Ascorbic Acid, pH-modifier, Relishes	Prior Art: 40 min. Present Invention: 20 min.	4.8	do.	5.0	do.	3.5	do., Change in Flavor, Shortage for Touch in Eating.	4.5	do., Slight Decrease in Flavor
B. 4. For Chinese "Mabo-Eggplant" Use	Soy, Sake, Edible Oil, Sugar, Tomato Ketchup, Ginger, Relishes Eyes of Scallops, Beef Extract, Salt	Prior Art: 20 min. Present Invention: 12 min.	4.0	Slightly Browned, Slight Decrease in Flavor	5.0	good	2.0	Slightly Browned, Decrease in Flavor, Slightly Salty, No Commercial Value.	4.0	Slightly Browned, Slight Decrease in Flavor
5. For Borsch Use	Tomato, Red Beets, Salt, Relishes, Spice, Meat Extract, Vegetable Extract	Prior Art: 20 min. Present Invention: 12 min.	4.0	Good, do.	5.0	do.	2.0	Redness of Tomato Browned, Decrease in Flavor, Change in Flavor, No Commercial Value.	4.3	Redness of Tomato Slightly Browned, do.

Table 2. Taste and Organoleptic Examinations Immediately After Heating Sterilization and After Preservation for 6 Months in Prior Art and the Present Invention Methods (contd.)

Food	Principal Raw Material	Heating Sterilization Time	Organoleptic Examination							
			Taste and Organoleptic Tests Immediately After Heating Sterilization				Taste and Organoleptic Tests After Preservation for 6 Months			
			Prior Art			Present Invention			Present Invention	
			Evaluation	Color	The Others	Evaluation	Color	The Others	Evaluation	Color	The Others
B.											
6. For Pork Curry Use	Edible Oil, Milk, Flour Sugar, Salt Protein Hydrolysate, Meat Extract Flavor Vegetable	Prior Art: 25 min. Present Invention: 13 min.	5.0	Good		5.0	Good		3.5	Browned	Decrease in Curry Flavor	4.5	Slightly Browned	Slight Decrease in Flavor
C.														
7. Soup (Corn Cream)	Sweet Corn, Milk, Flour Sugar, Salt Edible Oil, Relishes, Protein Hydrolysate, Meat Extract Spice	Prior Art: 30 min. Present Invention: 15 min.	4.5	Slightly Browned	Slight Decrease in Corn Flavor	5.0	do.		3.5	Browned	Decrease in Flavor, Change in Flavor	4.5	Slightly Browned	Slight Decrease in Corn Flavor
8. Boiled Land & Sea Foods	Bamboo Shoot Flaked Tuna, Konjak, Relishes	Prior Art: 50 min. Present Invention: 25 min.	4.5	Good	Slight Decrease in Flavor	5.0	do.		3.5	do.	Decrease in Flavor, Slight Change in Flavor	4.5	do.	Slight Decrease in Flavor
9. Hamburger Steak	Pork, Beef, Onion, Potato, Bread Crumb, Flour, Edible Oil, Relishes	Prior Art: 35 min. Present Invention: 18 min.	4.5	do.	Slight Shortage for Touch in Eating	5.0	do.		0	Violently Browned	Strong Change in Flavor, Less than Edible Limit	3.5	do.	Slight Decrease in Flavor, Some Change in Flavor

Table 2: Taste and Organoleptic Examinations Immediately After Heating Sterilization and After Preservation for 6 Months in Prior Art and the Present Invention Methods (contd.)

Food	Principal Raw Material	Heating Sterilization Time	Organoleptic Examination					
			Taste and Organoleptic Tests Immediately After Heating Sterilization				Taste and Organoleptic Tests After Preservation for 6 Months	
			Prior Art		Present Invention		Prior Art	Present Invention
			Evaluation	Color The Others	Evaluation	Color The Others	Evaluation Color The Others	Evaluation Color The Others
C.								
10. Meatball	Pork, Beef, Onion, Bread Milk, Egg, Relishes	Prior Art: 45 min. Present Invention: 25 min.	4.5	Good Slight Shortage for Touch in Eating	5.0	Good	0 Violently Browned Strong Change in Flavor, Less than Edible Limit	3.8 Slightly Browned Slight Decrease in Flavor

A: Raw Material Foods
B: Blended Condiments
C: Fabricated Foods

[Test Example 2]

The sterilization in prior art method was carried out in accordance with the same manner with that of Test Example 1, but the heating sterilization of the present invention was conducted as follows.

Various foods were cooked and processed, and then a pouch made of polyester (25 u)/silicon oxide (600 Å)/ cast polypropylene (70 u) was charged with the cooked and processed foods and sealed the same, thereafter the resulting package of the so charged pouch was irradiated in a microwave oven having an oscillation output of 4 KW for 4 minutes while turning over the package together with a supporting holder thereafter maintained at 125°C for 3 minutes, and then cooled for 4 minutes, thereby performing heating sterilization. Taste and organoleptic evaluations were made upon these products immediately after the heating sterilization as well as the products which were left naturally in a room (20 - 30°C) for six months, respectively, as in the case of the prior art method.

The test was conducted upon the foods designated by reference numerals 1, 2, 3, 8, 9, and 10 in Table 2. The results obtained in accordance with the prior art and the present invention methods were indicated in Items 1, 2, 3, 8, 9, and 10 of Table 2, respectively.

[Test Example 3]

In accordance with a prior art method, white stew and edible wild plants were cooked and processed. On one hand, a tray of 80 x 100 x 20 mm (160 cm^3 capacity) was fabricated by

vacuum-molding a laminating material made of cast nylon film (20 u)/vinylidene chloride film (20 u)/ cast polypropylene film (700 u). Furthermore, a covering material was prepared from a laminating material made of polyester film (25 u)/vinylidene chloride film (20 u)/cast polypropylene film (50 u). The tray was charged with 150 g of the above described foods and packaged with the covering material, respectively, and thereafter these trays were subjected to heating sterilization by utilizing a standing retortable apparatus in 125°C hot water.

Taste and organoleptic evaluations were made upon these products prior to and after the sterilization as in the case of Test Example 1.

In accordance with the present invention, a tray of 80 x 100 x 20 mm (160 cm^3 capacity) was fabricated by vacuum-molding a laminated material made of cast nylon film (20 u)/silicon oxide (1000 Å)/ cast polypropylene film (700 u). On one hand, a covering material was prepared from a laminated material made of polyester film (25 u)/silicon oxide (600 Å)/ cast polypropylene film (50 u). The tray was charged with 150 g of the same foods as that of the aforesaid prior art method and packaged with the covering material. respectively. These packages were placed on a supporting holder the case of Test Example 1, respectively. These packages were irradiated with microwave in a microwave oven of 4 KW for 4 minutes and maintained for 3 minutes. Thereafter the packages so treated were cooled for 3 minutes.

Taste and organoleptic evaluations were made upon these products in a similar manner to that described above. The results are indicated in Table 3.

Table 3: Taste and Organoleptic Examinations Immediately After Heating Sterilization and After Preservation for 6 Months in Prior Art and the Present Invention Methods

Food	Principal Raw Material	Heating Sterilization Time	Organoleptic Examination									
			Taste and Organoleptic Tests Immediately After Heating Sterilization						Taste and Organoleptic Tests After Preservation for 6 Months			
			Prior Art			Present Invention			Prior Art			Present Invention		
			Evaluation	Color	The Others	Evaluation	Color	The Others	Evaluation	Color	The Others	Evaluation	Color	The Others
White Stew	Milk, Butter Flour, Carrot, Potato Meat, Onion Spice	Prior Art: 30 min. Present Invention: 10 min.	3.0	Browned	Strong Milk Smell	5.0	Good		2.0	Remarkably Browned	No Commercial Value Change in Flavor Flavorless	4.0	Slightly Browned	Slight Decrease in Flavor
Boiled Wild Plants in Water	Bamboo Shoot, Champignon, Brake, Jew's-ear	Prior Art: 25 min. Present Invention: 10 min.	3.5	Good	Decrease in Feeling in Eating of Champignon	5.0	Good	Good Feeling in Eating	3.0	Slightly Browned	Gets out of Shape of Champignon	4.5	Slightly Browned	Slight Shortage for touch in Eating

[Test Example 4]

After cooking or processing the foods shown in Table 4, the resulting packages were heated to sterilize in accordance with a prior art and the present invention methods, respectively. Taste and organoleptic evaluations were made upon these products immediately after the heating sterilization as well as the products which were preserved for six months after the sterilization, respectively, and the results will be shown in the Table 4. In the above case, the procedure for taste and organoleptic evaluations as well as the standard therefor are identical with those of Test Example 1.

Prior Art Method

The respective foods were cooked and processed. On one hand, the cup-like container d having a dimension of 80 mmΦ x 40 mmH and shown in Fig. 7 was prepared by pressure-forming a polypropylene single layer having a thickness of 300 u. The container was charged with 160 g of the food c, and sealed with the polypropylene single layer film e having a thickness of 80 u. Then, the resulting package was subjected to standing retortable sterilization in 125°C hot water. Taste and organoleptic evaluations were made upon these products immediately after the retortable sterilization as well as the products which were left naturally in a room (20 - 30°C) for six months, respectively.

Method of the Present Invention

The laminated film J was prepared by metallizing 600 Å of silicon oxide on a polyester film having a thickness of 25 u,

coating the metallized surface with 4.5 g/m^2 of a urethane adhesive to bond 70 u of a cast polypropylene film onto said metallized surface, and further coating the opposite side of the silicon oxide with 4.5 g/m^2 of the urethane adhesive to bond 30 u of a cast polypropylene film onto said opposite side of the metallized surface. A spirally formed body of a cylindrical container was fabricated from the aforesaid laminated film as shown in Figs. 4 and 5.

The body of this cylindrical container has a configuration as shown in Fig. 4 which is an enlarged sectional view of the cylindrical container body as well as Fig. 5 which is a general view showing the section of said cylindrical container in an enlarged manner. More specifically, the laminated material J having the silicon oxide metallized layer as an intermediate layer used in the present invention is composed of, from the inside towards the outside thereof, 70 u of cast polypropylene layer A, 4.5 g/m^2 of urethane adhesive B, 600 Å of silicon monoxide metallized layer C, 25 u of polyester layer D, 4.5 g/m^2 of urethane adhesive B, and 30 u of cast polypropylene layer H. Moreover, the outer packaging material K is applied through 4.5 g/m^2 of urethane adhesive B and composed of 200 u of cast polypropylene layer E, 500 u of polypropylene layer F, and 30 - 50 u of polypropylene layer G.

The body of cylindrical container a as described above is fitted with a bottom cap b prepared from a plastic laminated material by means of injection molding to obtain a container of

52.3 mmΦ x 90 mmH shown in Fig. 6. On one hand, the respective foods c were cooked and processed, and said container was charged with 160 g of each food. The so charged container was fitted with an upper cap b made of the same plastic laminated material as the bottom cap b to seal the container. Thereafter, the sealed container was subjected to heating sterilization by repeating such an operating cycle as irradiation for 4 minutes with 4 KW output → holding for 2 minutes → irradiation for 2 minutes → holding 2 minutes until a prescribed sterilization is attained in a microwave irradiating oven while rotating or moving vibrating the container together with a supporting holder, and then cooling the container. Taste and organoleptic evaluations were made upon these products immediately after the heating sterilization as well as the products which were left naturally in a room (20 - 30°C) for six months, respectively, as in the case of the prior art method. The results obtained are shown in Table 4.

Table 4: Taste and Organoleptic Examinations Immediately After Heating Sterilization and After Preservation for 6 Months in Prior Art and the Present Invention

Food	Principal Raw Material	Heating Sterilization Time	Organoleptic Examination							
			Taste and Organoleptic Tests Immediately After Heating Sterilization						Taste and Organoleptic Tests After Preservation for 6 Months					
			Prior Art			Present Invention			Prior Art			Present Invention		
			Evaluation	Color	The Others	Evaluation	Color	The Others	Evaluation	Color	The Others	Evaluation	Color	The Others
1. For Borsch Use	Tomato, Red Beets, Salt Relishes, Spice, Meat Extract Vegetable Extract	Prior Art: 50 min. Present Invention: 16 min.	4.0	Good	Slight Decrease in Flavor	5.0	Good		1.0	Tomato's Redness Browned	Decrease in Flavor, Change in Flavor, No Commercial Value	4.3	Tomato's Redness Slightly Browned	Slight Decrease in Flavor
7. Soup (Corn Cream)	Sweet Corn, Milk, Flour Sugar, Salt Edible Oil, Relishes, Protein Hydrolysate, Meat Extract, Spice	Prior Art: 60 min. Present Invention: 20 min.	4.5	Slightly Browned	Slight-Decrease in Corn Flavor	5.0	do.		2.0	Browned	do.	4.5	Slightly Browned	Slight-Decrease in Corn Flavor

(Heating Sterilization Time extends from the start of heating to the completion of cooling)

As indicated above, the present invention method can provide clearly a product of higher quality than that processed by prior art method, besides larger differences are observed therebetween after preservation for 6 months.

Industrial Applicability

The present invention has the construction as mentioned above and the advantages attained thereby is such that a heating period of time required is shorter in the microwave heated cooked food according to the present invention the contents of which are visible and which can be preserved for a long period of time than that in the products in accordance with conventional retortable sterilization, so that quality of the food immediately after the heating sterilization is good. In addition, since a transparent packaging material having high barrier properties is utilized in the present invention, the contents of the package are visible and the high quality of the food after the heating sterilization can be maintained without change, so that the cooked food became possible to be preserved at ordinary temperatures for a long period of time.

Claims

1. A microwave heated cooked food the contents of which can be observed and which is possible to be preserved for a long period of time comprising said contents being placed in a container made from a transparent and microwave permeable laminate packaging material prepared by disposing a thin layer of a metallic oxide alone or a mixture thereof, as an intermediate layer, between a heat resistant synthetic resin film base alone or a laminate thereof and a heat-sealable, heat resistant synthetic resin film alone or a laminate obtained therefrom containing said film as the innermost layer; and then said container being irradiated with microwave thereby heating said contents to sterilize the same.

2. A microwave heated cooked food the contents of which can be observed and which is possible to be preserved for a long period of time as claimed in claim 1 wherein said metallic oxide alone or a mixture thereof is a silicon oxide alone or a mixture thereof.

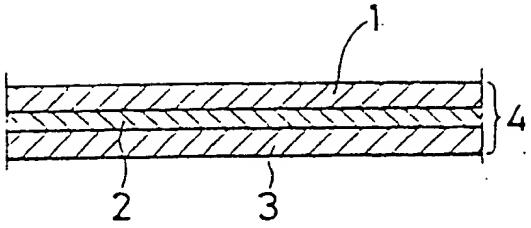

FIG. 1

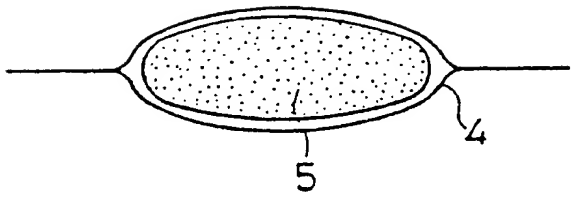

FIG. 2

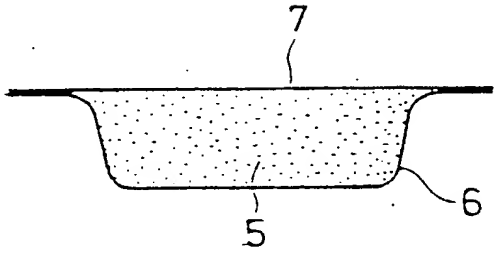

FIG. 3

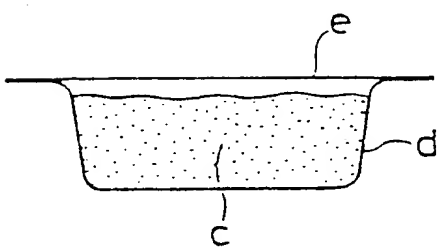

FIG. 7

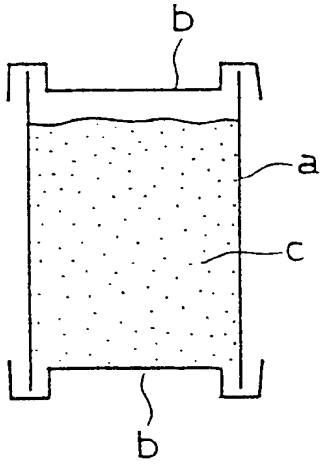

FIG. 6

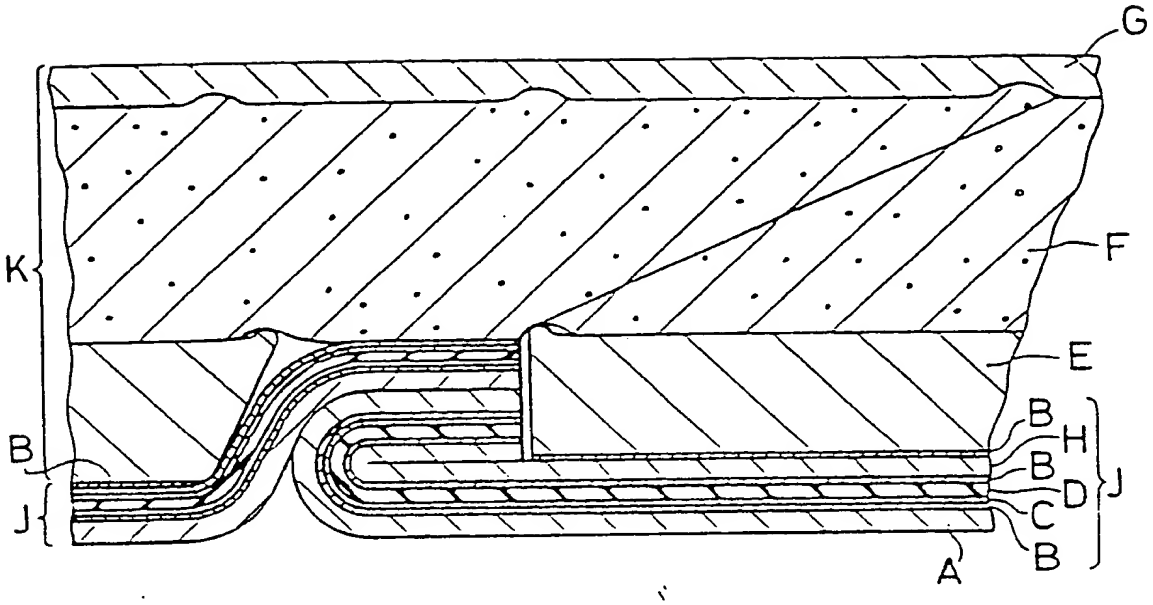

FIG. 4

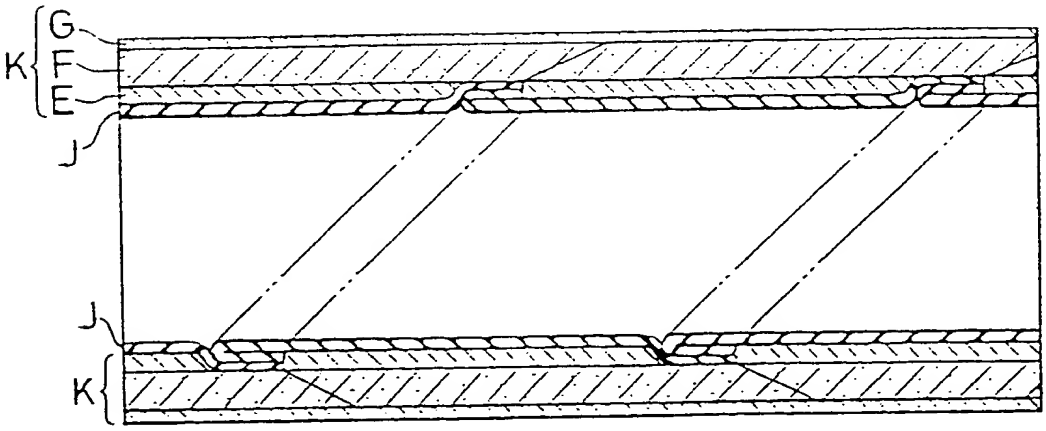

FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No. PCT/JP86/00471

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl[4] B65D81/24, B65D81/34

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC	B65D81/24, B65D81/34, B32B15/08

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Koho 1926 - 1986
Kokai Jitsuyo Shinan Koho 1971 - 1986

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category*	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
Y	JP, A, 54-121337 (Chuo Kagaku Co., Ltd.) 23 April 1981 (23. 04. 81) (Family: none)	1-2
Y	JP, A, 55-126063 (Oscar E. Saifirth) 29 September 1980 (29. 09. 80) & DE, A, 3010189 & FR, A, 2451182 & GB, A, 2046060 & GB, B, 2046060 & CA, A, 1153069 & FR, B, 2451182 & JP, B2, 60-15548	1-2
A	JP, A, 59-142139 (Idemitsu Petro-Chemical Co., Ltd.) 15 August 1984 (15. 08. 84) & JP, A, 58-212944 & EP, A, 96581	1-2
A	JP, U, 53-40875 (Dainippon Printing Co., Ltd.) 8 April 1978 (08. 04. 78) (Family: none)	1-2

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
December 8, 1986 (08. 12. 86)	December 8, 1986 (08. 12. 86)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
Japanese Patent Office	

Form PCT/ISA/210 (second sheet) (October 1981)